

4. Educational signs should be placed where appropriate at beach access points explaining the importance of the area to sea turtles and/or the life history of sea turtle species that nest in the area.

In order for the FWS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the FWS requests notification of the implementation of any conservation recommendations.

#### REINITIATION

This concludes formal consultation on the action(s) outlined in the initiation request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation in the effort to protect threatened and endangered sea turtles and their nesting habitat. If you any questions regarding this biological opinion, please do not hesitate to contact Chuck Sultzman of our office at (561) 562-3909.

Sincerely,



Craig Johnson  
Supervisor, South Florida Ecosystem Office

cc:

FWS, Jacksonville, FL (Attn: Sandy MacPherson)  
FDEP (OPSM), Tallahassee, FL  
NMFS, St. Petersburg, FL

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# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
South Florida Ecological Services Office  
P.O. Box 2676  
Vero Beach, Florida 32961-2676



October 4, 2000

James C. Duck  
Chief, Planning Division  
Jacksonville District Corps of Engineers  
P.O. Box 4970  
Jacksonville, Florida 32232-0019

Service Log No.: 4-1-00-F-701  
Cross Reference No.: 4-1-96-F-268  
Public Notice Date: June 1, 2000  
Project: 63<sup>rd</sup> Street Renourishment  
Local Sponsor: Miami-Dade County  
County: Miami-Dade

Dear Mr. Duck:

The Fish and Wildlife Service (Service) has reviewed the plans submitted for the project referenced above. The project has the potential to affect four species of sea turtles. Florida's beaches function as nesting habitat for the threatened loggerhead turtle (*Caretta caretta*) as well as the endangered green turtle (*Chelonia mydas*), leatherback turtle (*Dermochelys coriacea*), and hawksbill turtle (*Eretmochelys imbricata*).

Your letter, dated June 5, 2000, states that the Biological Opinion (BO) dated October 24, 1996, for Region III of the Coast of Florida Erosion and Storm Effects Study includes the project area considered for the proposed renourishment. You also proposed that the "Reasonable and Prudent Measures" and "Terms and Conditions" listed in the BO that are applicable for Miami-Dade County apply to the proposed renourishment, and that you plan to incorporate these requirements into the project plans and specifications and any contracts as appropriate. You also requested concurrence on this determination. This letter is provided in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (ESA).

The Coast of Florida Biological Opinion, dated October 24, 1996, is a Programmatic Biological Opinion that addresses beach nourishment impacts to sea turtles in Palm Beach, Broward, and Miami-Dade counties. The BO states that separate biological opinions will be prepared for individual projects as more advanced planning and information becomes available.

The Service agrees with the determination that the project limits are within the area defined in the Coast of Florida BO, however, Service guidance on section 7 consultations on sea turtles has been revised and has resulted in project specific changes in the "Reasonable and Prudent Measures" and "Terms and Conditions" of the Coast of Florida BO. The following sections of the Coast of Florida BO have been changed. All other parts of the Coast of Florida BO are applicable to the 63<sup>rd</sup> Street Renourishment Project.

#### Lighting Term and Condition (Term and Condition 7)

From April 1 to November 30, all on-beach lighting associated with the project shall be limited to the immediate area of active construction only and shall be the minimal lighting necessary to comply with safety requirements. Shielded low pressure sodium vapor lights are recommended to minimize illumination of the nesting beach and nearshore waters. Lighting on offshore equipment shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the water, while meeting all U.S. Coast Guard and OSHA requirements. Shielded low pressure sodium vapor lights are highly recommended for lights on offshore equipment that cannot be eliminated.

#### Incidental Take Statement

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document,

the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

#### Amount or Extent of Incidental Take

The Service has reviewed the biological information and other information relevant to this action. Based on this review, incidental take is anticipated for (1) all sea turtle nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) all sea turtle nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (4) disorientation of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (5) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; (6) all nests destroyed as a result of escarpment leveling within a nesting season when such leveling has been approved by the Fish and Wildlife Service; and (7) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site

Incidental take is anticipated for only 0.53 miles (2,800 feet) of beach that have been identified for sand placement. The Service anticipates incidental take of sea turtles will be difficult to detect for the following reasons: (1) the turtles nest primarily at night and all nests are not found because [a] natural factors, such as rainfall, wind, and tides may obscure crawls and [b] human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program; (2) the total number of hatchlings per undiscovered nest is unknown; (3) the reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown; (4) an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area; (5) lights may disorient an unknown number of hatchlings and cause death; and (6) escarpments may form and cause an unknown number of females from accessing a suitable nesting site. However, the level of take of these species can be anticipated by the disturbance and renourishment of suitable turtle nesting beach habitat because: (1) turtles nest within the project site; (2) beach renourishment will likely occur during a portion of the nesting season; (3) the renourishment project will modify the incubation substrate, beach slope, and sand compaction; and (4) artificial lighting will disorient nesting females and hatchlings.

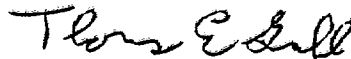


#### Terms and Conditions - Summation Paragraph

The reasonable and prudent measures, with their implementing terms and conditions; are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than a one-time placement of sand on the 0.53 miles (2,800 feet) of beach proposed for nourishment. If during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

This concludes formal consultation with the Service for the 63<sup>rd</sup> Street Beach Renourishment Project. Thank you for your cooperation in the effort to protect threatened and endangered sea turtles and their nesting habitat. We are available to meet with agency representatives to resolve outstanding resource issues associated with this project. If you have any questions, please contact Mr. Allen Webb at (561) 562-3909 extension 246.

Sincerely yours,



*J. Slack*  
James J. Slack  
Field Supervisor  
South Florida Ecological Services Office

cc:

NMFS, Mike Johnson, Miami, FL (w/o enclosure)  
EPA, West Palm Beach, FL (w/o enclosure)  
Service, Sandy Macpherson, Jacksonville, FL (w/o enclosure)  
FWC, Robbin Trindell, Tallahassee, FL (w/o enclosure)  
FDEP, Keith J. Mille, Tallahassee, FL (w/o enclosure)  
Miami-Dade County DERM, Miami, FL (w/o enclosure)

## **APPENDIX E – PHYSICAL AND BIOLOGICAL MONITORING PROGRAM**

**\*\*\* DRAFT \*\*\***

Dade Co. Sunny Isles Renourishment-Design Modification Monitoring Plan

April 5, 2000 Pg. 1

**SUNNY ISLES RENOURISHMENT – DESIGN MODIFICATION;  
DADE COUNTY EROSION CONTROL PROJECT**

**Physical and Biological Monitoring Program For Dade County, Florida,  
Beach Erosion Control And Hurricane Protection:  
SUNNY ISLES RENOURISHMENT – DESIGN MODIFICATION**

Submitted by  
Miami-Dade County Department of Environmental Resources Management

as partial fulfillment of special provisions of the  
U.S. ARMY CORPS OF ENGINEERS PLANS AND SPECIFICATION

and special conditions of  
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP)  
Joint Coastal Permit # 0126527-001-JC

## MONITORING PROGRAM COMPONENT OUTLINE

### **I. BIOLOGICAL MONITORING.**

- I.1 Monitoring Stations.
- I.2 Monitoring Frequency.
- I.3 Sampling Regime and procedures.
  - I.3.1 Quantitative Biological Surveys.
  - I.3.2 Qualitative Surveys.

### **II. SEDIMENT AND SEDIMENTATION MONITORING.**

- II.1 Sedimentation Deposition Rates.
- II.2 Reef Sediment Accumulation Surveys.
- II.3 Indicators Of Impending Or Imminent Sediment Impacts.
- II.4 Sediment Violations.

### **III. VISUAL SURVEYS OF HABITATS ADJACENT TO THE BORROW AREA AND BREAKWATERS.**

### **IV. DREDGE SLURRY PIPELINE CORRIDOR CORAL PROTECTION AND IMPACT ASSESSMENT.**

- IV.1 Hard Coral Protection Measures.
- IV.2 Pipeline Coral Impact Assessment.
- IV.3 Monitoring of Impacted Hard Corals.

### **V. FILL MATERIAL ANALYSIS, COMPACTION AND BEACH TILLING.**

- V.1 Compaction Monitoring.
- V.2 Weekly Grain Size Analysis Of Beach Fill.

### **V. SEA TURTLE MONITORING AND NEST RELOCATION PROGRAM.**

- VI.1 Daily Beach Surveys For Nesting Activities.
- VI.2 Nest Relocation Program.
- VI.3 Escarpment Leveling.

### **VII. HYDROGRAPHIC SURVEYS AND BEACH FILL PERFORMANCE.**

- VII.1 Scope Of Hydrographic Survey Plan.
- VII.2 Monitoring Plan Objectives.
- VII.3 Monitoring Plan Components.

### **VIII. REPORTING.**

## DESCRIPTION OF MONITORING COMPONENTS

**I.0. BIOLOGICAL MONITORING.** The biological monitoring will utilize a BACI (Before-After-Control-Impact) Design. This design establishes monitoring stations with randomly selected sites within an area of probable impact, and in areas of similar habitat outside the region of possible impact, for comparisons prior to and after conduct of the project. The inclusion of the "control" locations allows for correction of differences noted in the pre/post evaluations, for variations or differences that were not specifically associated with the project (i.e., storm effects, regional habitat disruptions).

**I.1 MONITORING STATIONS.** Minimally five biological monitoring stations will be established for this project. Three will be adjacent to, and two distant from, the borrow area. The sand source (borrow area) to be used for this project is located east of Key Biscayne (Figure 1) in approximately 43 to 48 feet of water. Extensive hardbottom reefs occur in the general region of the borrow source. North/south expanses of hardbottom reef are located to the east and west, and patch reefs occur on the western side of the borrow area. Proximity of the reefs to the borrow area ranges between 400 feet to greater than 1000 feet. Monitoring station location will be selected based on the neighboring hardground reef lines and known local current patterns, so that selected sites will represent the anticipated areas with highest probability of impact (relative to distance and current direction).

- A. A minimum of three stations will be established adjacent to the borrow area. Two "reference" or comparison stations will be positioned approximately 5 miles south of the borrow area in areas with similar water depths and based on qualitative assessment, show similar composition and densities of biological community components. Each station will be set (marked) by fixing a randomly selected "Station Reference Point" on the reef edge.
- B. Each Station will be comprised of five randomly placed 2.1 m X 2.0 m quadrats (total sample area of 21.0 m<sup>2</sup>/site) for determination of benthic community components. The quadrat location will allow for determination of any impacts across the entire reef tract.
  - 1. The location of each of the quadrats will be determined by randomly choosing a distance and direction from the reference point (max distance = 100 m or one-half the width of the reef at the reference point, which ever is less).
  - 2. Each quadrat will be oriented normal to the prevailing direction of the reef tract (i.e., N/S), marked with an iron bar, and all have corner points marked with stainless steel pins to allow precise relocation.
    - a. Each quadrat will be subdivided into six 1.0 m X 0.7 meter subplots, to aid in photogrammetric analysis of the quadrat.
    - b. Each subplot will be marked with stainless steel pins to allow precise relocation.

**I.2. MONITORING FREQUENCY.** The sampling frequency for each monitoring task is summarized in Table 1. Each site will be visited quarterly for complete quantitative or qualitative photographic surveys.

- A. Quantitative assessments will be conducted minimally once prior to, once immediately after completion of project construction and every six months thereafter for a minimum of two years.
- B. Qualitative assessments will be conducted three months after the post construction quantitative survey, and every six months thereafter until completion of the monitoring program.

I.3. *SAMPLING REGIME AND PROCEDURES.* The quantitative and qualitative sampling procedures and techniques are described below.

#### I.3.1 Quantitative Biological Surveys.

- A. Benthic community structure will be quantitatively evaluated at each monitoring station using a photogrammetric technique. The technique will include 35 mm photography, ground-truthing and video documentation during each quantitative sampling.
  - 1. Density, frequency and diversity of hard-corals, soft corals, sponges, other noted benthic invertebrates and algae will be determined during quantitative surveys via mapping of 1.0 m X 0.7 m subplots of the 2.0 m X 2.1 m quadrats (six subplots per quadrat). All hard corals will be measured (major and minor axis) to determine hard coral coverage.
  - 2. All photography and mapping will be conducted by qualified biologists utilizing SCUBA. All hard and soft corals, and common sponges and algae will be field identified to the lowest possible taxonomic rank. Voucher specimens may be taken, outside of the sampling quadrat, for unknown organisms and identified in the laboratory.
  - 3. Each subplot will be photographed using an underwater camera (i.e., Nikonos-V) and strobe, mounted on a prefabricated "framer". The framer will hold and position the camera and strobe for optimal resolution of the subplot area. The photographs will be used to verify the percent of cover of hard corals through planimetric analysis of projected images as necessary. Further, the photographs will serve as documentation of the benthic community components within the subplots.
- B. Water Quality. Profiles of the water column will be conducted at each biological monitoring station, in 3 m depth increments (i.e., surface, 3 m, 6 m, 9 m, etc.), from the surface to the bottom for the parameters listed below. A single sampling assemblage consisting of a multi-sensor array, light sensor and water sampling tube, will be lowered into the water to insure simultaneous sampling of measured parameters and collection of water samples for laboratory analysis.
  - 1. Light levels will be measured using a Li-Cor® dual sensor array (one surface, one underwater sensor). Surface and at-depth photon flux densities will be recorded with a Li-Cor® LI-1000 datalogger. Light measurement units will be  $\mu\text{E}/\text{m}^2/\text{s}$  (of PAR).
  - 2. Turbidity levels will be determined on samples collected during the Water Quality Profiling (minimally for the surface, mid depth and bottom samples).

Samples will be read on a laboratory calibrated Hach® portable turbidity meter (or equivalent) and recorded in NTU's (Nephelometric Turbidity Units).

3. Temperature, pH, salinity, dissolved oxygen and oxidation-reduction potential will be measured using a Hydrolab® "Surveyor-IV" multi-sensor data logger.

4. Nutrient levels (ammonia, organic nitrogen [NOx], and total phosphate) will be determined for the top, mid-level and bottom samples. Analysis will be conducted as per the D.E.R.M. Laboratory Comprehensive Quality Assurance Plan (FDEP Tracking # 870238G).

- C. Fish Populations of the hard-bottom habitats will be estimated via the Bohnsack and Bannerot (1986) Technique. A minimum of 6 replicates per station will be used to estimate the species composition, abundance and biomass of the fish population.

### **I.3.2 Qualitative Surveys of biological monitoring stations (Three months post-construction and every six months thereafter).**

- A. Visual surveys and photographic documentation. Each station will be assessed visually for any abnormal or unusual characteristics. Each of the five quadrats at each station will be photographed using the techniques as described for the quantitative surveys, to document the interim status of the monitoring sites. Ground-truthing of the sites will not be conducted during these surveys, however, divers will note any obvious alterations or changes in the general hard-bottom habitat.
- B. Water Quality. Light penetration and water quality profiles, as described for the quantitative sampling, will be conducted during the Qualitative Survey period.

## **II. SEDIMENTATION AND SEDIMENT MONITORING.**

**II.1 SEDIMENT DEPOSITION RATES** The comparative rates of sediment deposition on hard-bottoms adjacent to the borrow area and comparison sites will be assessed on a quarterly bases.

- A. Relative sediment deposition rates will be measured via sediment traps located at the reef edge proximal to the borrow area. Minimally triplicate traps will be used to estimate the relative sediment "fallout" from the water column. The traps will sample 0.5 m above the reef bottom.
- B. A minimum of eight sediment deposition stations will be established. A sediment collection array will be placed at the following locations (Figure 1):
1. On the reefs adjacent to the biological monitoring stations located midway along the borrow area (minimum of 2 stations).
  2. 0.25 mile north of the northern limit of the borrow area (2 stations).
  3. 0.25 mile south of the southern limit of the borrow area (2 stations).

4. On the reefs adjacent to the biological monitoring control stations (2 stations).

- C. Sediment arrays will be collected as described below to determine deposition rates. Rates will be expressed in milligrams sediment per square-centimeter per day ( $\text{mg}/\text{cm}^2/\text{day}$ ).
1. During Construction
    - a. During periods with no indications of sediment stress on the hardgrounds, samples will be collected biweekly.
    - b. During periods with any level of sediment stress, samples will be collected weekly.
  2. Pre-/Post-Construction. Samples will be collected during quantitative and qualitative samplings (i.e., quarterly).

**II.2 REEF SEDIMENT DEPTH/ACCUMULATION.** The depth of sediment on the reef areas will be measured at, and adjacent to the fixed sediment deposition stations. Reef sediment depth measures will be recorded at fixed stations and from random measures taken in the area around the sediment deposition arrays.

- A. At each monitoring site the sediment depth will be assessed by two means.
1. Random Measures. At each sediment deposition station, 15 random measures of the sediment depth will be taken on the reef surface during each assessment in the immediate area of the fixed station (measurements will exclude crevasses, depressions and gullies). Measures will be made with a ruler graduated in mm. Measures will be recorded to the nearest mm.
  2. Biological Monitoring Station Sub-quadrat Measures (semi-annual). At each biological monitoring station quadrat, a measure of the sediment depth will be taken at the corners of each sub-quadrat. Measures will be made with a ruler graduated in mm. Measurements will be recorded to the nearest mm.
- B. During the construction phase each station will be visited minimally on a weekly basis. If excessive levels are detected (See Sections II.3 and II.4), assessments of sediment levels will be conducted no less than 2 times a week until the sediment levels return to acceptable levels.
- C. The random measures will be averaged and, along with the fixed station measures, compared to previous sampling levels to determine accumulation rates. Measures taken at the biological stations will be used to correlate sediment levels with any documented biotic community changes.

**II.3 INDICATORS OF IMPENDING OR IMMINENT SEDIMENT IMPACTS.** Possible or imminent sediment impacts refer to identification of conditions or observations that indicate benthic organisms are being, or have been stressed by factors other than natural events. Thus, indications of possible impact will be based on comparative observations between borrow area locations and the "control" or comparison sites. In the event that an indication(s) of pending or imminent impact to benthic community components are documented during the construction surveys, the FDEP and the ACOE will be notified immediately of the possibility of violation of sediment levels on the reefs.



Notification will be by phone, radio or fax, and followed by a written report to be submitted within 24 hours, or on the next work day if the indicators are noted on a weekend or holiday. Indicators of possible of imminent impact include but are not limited to:

- A. Standing sediment on hard corals, soft corals, sponge or other organisms that is not removed by normal currents or wave action.
- B. Excessive mucus on hard corals, without indications of bleaching.
- C. Excessively extruded polyps (e.g., sediment removal process).
- D. Mottling of color of benthic organisms (soft corals, algae, sponges, etc).

**II.4 SEDIMENTATION VIOLATIONS.** In the event that irreversible impacts (i.e., organism or organism tissue death) to benthic community components are documented during the construction phase surveys, the FDEP and the ACOE will be notified immediately of the possibility of a violation of sediment levels on the reefs and impact to the benthic reef community. Notification will be by phone, radio or fax, and followed by a written report to be submitted within 24 hours, or on the next working day. Should a violation be noted on a weekend or holiday, DERM will attempt to notify the ACOE Project Engineer and the FDEP "on-call" officer (if one is so designated). If no FDEP, "on-call" officer is designated, then notification will be given as soon as possible on the next business day. A violation will be defined as a significant build-up of sediment sufficient to cause any one or more of the following conditions:

- A. A frequency of observed bleaching (partial or complete) of hard coral colonies, significantly above the level found at the control stations.
- B. Excessive mucus produced by hard corals to remove sediment from their surface, resulting in binding of sediments and transport of bound sediments off the coral's surface and subsequent accumulation of the sediments at the base of the coral head. Such accumulations have been seen to initiate a "self burial" process, causing death of the lower tissue of the coral head.
- C. Covering of benthic community components (i.e., sponge, algae) by sediment for sufficient time or sufficient sediment so as to note death or degradation (i.e., bleaching, pigmentation changes) of the underlying organisms.

If a violation is found, DERM will initiate an assessment to determine the extent of impact to biological communities. DERM will monitor the sediment level after a violation, minimally twice a week to determine the point in time when the sediment level has decreased to within 0.5 cm from initial datum.

Any biological impact assessment will focus around the information in hand from DERM's Biological Monitoring Stations which are adjacent to the borrow area. Other sites can be added if it appears that the impact is significantly greater in areas distant to the existing biological monitoring stations.

### **III. VISUAL SURVEYS OF HABITATS ADJACENT TO THE BORROW AREA AND THE BREAKWATERS DURING THE CONSTRUCTION PHASE.**

#### **III.1. VISUAL SURVEYS OF HARDBOTTOM REEFS ADJACENT TO THE BORROW AREA.**

Visual assessment of the condition and status of the benthic community has been found to be the best method for eliminating or minimizing impact to the hardground reef community. Visual surveys of hardground adjacent to the borrow area will be conducted minimally on a semi-weekly (twice weekly) basis. During the survey, a qualified biologist using scuba, and assisted with diver propulsion vehicles, will visually inspect the hardground areas that are adjacent to the borrow area. The biologist will note the general level of sediment and watch for indications sediment impact, as described above.

- A. At least one of the weekly surveys will be conducted by a DERM biologist with a degree in Marine Biology or related field and minimum of 5 years experience in impact characterization and assessment.
- B. The second weekly survey may be conducted by a qualified DERM biologist with knowledge and experience in marine organism identification and benthic monitoring of the offshore reef areas.
- C. Surveys of the hardground areas will be incorporated into the sedimentation monitoring as described in Section II of this plan.

#### **III.2 VISUAL SURVEYS OF SIGNIFICANT HABITAT AREAS ADJACENT TO THE BREAKWATER CONSTRUCTION AREA.** This portion of the monitoring plan has two elements: Pre and post project quantification of habitat components and biweekly visual surveys of the area during construction of the breakwaters.

- A. Pre and post project quantification of habitat components to allow determination of magnitude and extent of any impact.
  - 1. Thirteen random points were selected in the area defined as significant habitat(Figure 1). Due to the discontinuous nature of the significant habitat, some points may need to be discarded. A minimum of ten points will be retained, which will serve as the center points of randomly oriented belt transects (0.5 m wide by 25.0 m long). Each transect will be assessed by two DERM biologists skilled in the identification of local benthic marine organisms. Video documentation will be recorded by divers traversing the length of each transect with the camera, scanning a 0.5 m wide path (a pre-measured PVC pipe will be included in the video for scale) and the depth of each transect center point recorded.
    - a) Each hard coral, soft coral, and sponge within the transect will be counted and identified to the lowest possible taxonomic rank. Additionally, the dimensions (major and minor axis) of any hard coral colonies documented will be recorded.

- b) Relative abundance of other benthic organisms (common macroalgae, hydrocorals, and zooanthids) will be recorded as well.

Habitat assessments will be conducted prior to, and within three weeks of completion of the project to allow comparison of the organisms' densities and the hard corals' sizes.

- B. Visual monitoring of the areas adjacent to the breakwater construction areas, during construction to allow assessment of construction related activities (impact from misplaced materials; sedimentation, physical scouring, or dislodging of organisms associated with "prop-wash" from tugs and other vessels used during construction of the breakwaters).
  - 1. DERM divers will survey the western border of the area of significant habitat immediately adjacent to the breakwater construction area, twice weekly during the period of breakwater construction (Figure 1). Divers conducting the surveys will have experience in identification and assessment of dredging/ construction activity related benthic impacts, as well as of identification of indicators of sedimentation stress on benthic organisms. The surveys will assess for:
    - a) Indications of physical impacts associated with construction related equipment or activities. This may include:
      - i. Impacts associated with "prop-blast" from tugs or other heavy barge equipment used in the area.
      - ii. Scraping or dragging of cables, anchors or other construction related equipment.
      - iii. Debris or misplaced materials associated with the construction of the breakwaters.
    - b) Indicators of sedimentation or sediment stress on the benthic organisms within the area. Divers will utilize the same criteria as listed in Section II.3 of the monitoring plan.

#### **IV. DREDGE SLURRY PIPELINE CORRIDOR HARD CORAL PROTECTION AND IMPACT ASSESSMENT.**

**IV.1 HARD CORAL PROTECTION MEASURES.** DERM will implement protection measures prior to and during the placement of the slurry pipeline to reduce hard coral and benthic impact associated with the pipeline placement. These measures will include:

- A. Marking of the Pipeline Corridor. The southern boundaries of the pipeline corridors will be marked prior to pipeline placement with 6-8" Styrofoam buoys. A Differential Global Positioning System (DGPS) will be used to determine the corridor's location and buoy placement.
  - 1. The corridor will be permanently set by exposing stainless steel eyebolts, or other durable fixture, into the substrate at intervals of approximately 0.1 NM (~600 ft). Subsurface buoys will be affixed to the eyebolts to allow rapid relocation of the corridor.
  - 2. Marked Styrofoam buoys will be affixed to the eyebolts and stay in place during the positioning and deployment of the pipeline.
- B. Coral head Relocation. The pipeline corridor will be surveyed by DERM prior to mobilization of the pipeline, to determine the feasibility of relocating hard coral colonies

within the pipeline corridor. All hard coral colonies greater than 0.75 m in it's greatest dimension, that can feasibly be moved without causing damage to the colony, will be relocated to an area outside of, but adjacent to, the pipeline corridor.

- C. **Marking of Large Coral Heads.** All large hard coral heads ( $\geq 1.0$  m diameter) that exist within the corridor will be marked with a distinctive buoy (e.g. colored) prior to positioning of the pipeline. This will allow visualization of the line of minimal impact to the contractor, to assist in minimizing impact to coral heads.
1. The position of each marked coral head will be recorded using DGPS.
  2. When possible (i.e., the size and structure of the coral head permit), the coral head may be moved to provide a clearer path for the pipeline. It should be noted, however, that pre-project surveys indicate the great majority of large coral heads within the corridor are considered non-movable, due to the coral head shape (i.e., flat, totally adherent plate form) or poor structural integrity (the mass of the coral head is highly bio-eroded).
  3. DERM will work as closely as possible with the contractor to insure the pipeline is placed in such a manner to minimize impact and avoid marked large coral heads.
- D. **Stabilizing Coral Heads.** After placement of the pipeline the region will be surveyed and all impacted coral heads, as well as all possible coral heads in jeopardy (i.e., within the shadow of the pipeline) will be moved to an adjacent area, away from the influence of the pipeline.
1. Fractured coral heads will be stabilized using either Portland cement or Liquid- Rock<sup>®</sup> epoxy. Coral heads will be stabilized in as natural a position as possible.
  2. Threatened coral heads will be chiseled from the substrate, when feasible (See IV.A.2. for criteria) and moved to an area outside the pipeline corridor and stabilized.

**IV.2 PIPELINE CORAL IMPACT ASSESSMENT.** The actual impact from the placement of the pipeline placement will be determined by pre- and post-placement surveys of the pipeline corridors. Quantitative surveys of the corridor have been conducted to document pre-project conditions. The post-construction surveys will be conducted within 21 days after the removal of the pipeline. The damage assessment will be conducted as follows:

- A. The contractor will mark the true location of the pipeline with temporary buoys, placed sufficiently to allow divers to swim the length of the pipeline (no greater than 1000 feet apart). Buoys are to remain after removal of the pipeline.
1. The contractor will notify DERM within 24 hours of the completion of placement of the pipeline location buoys.
  2. DERM will document the condition of the corridor after pipeline placement via video tape.
  3. After the pipeline has been removed from the reef, DERM will survey the damage path along the pipeline's length to determine the actual area of impact.

- a. The width of the path will be considered the area within which the limestone "bedrock" has been cleared and exposed, and/or benthic organisms directly in the path or adjacent to the pipeline are crushed, fractured, abraded, heavily bleached or otherwise damaged.
- b. Impact to organisms and areas of benthic damage will be quantified by direct measurement. Quantification will include:
  - aa. Measurement of all fractured, abraded, bleached or otherwise impacted hard corals.
  - bb. Count of all damaged (abraded, broken, loose) soft corals.
  - cc. Measurement of fractured, scarified, abraded or otherwise damaged substrate, where encrusting or low-profile organisms were growing.
- c. Impact from the pipeline will be the total sum of impacts to hard coral, soft corals and bedrock. The calculated area of damage and subsequently used to calculate mitigation requirements.
- d. The corridor will be documented by video-tape and still photography.

**IV.3 MONITORING OF IMPACTED HARD CORALS.** All hard corals impacted or relocated in association with the pipeline placement will be monitored for a two year period following construction. The monitoring will utilize a photogrammetric technique, with ground truthing to document percent survivorship of the individual coral head. The relocation sites will be monitored at 3 months, 6 months and on a semiannual basis for the remainder of the monitoring period.

- A. **Photogrammetric Technique.** Coral heads will be photographed with a Nikonos®V 35mm camera, at a fixed distance from the coral head. All corals will be photographed with a scaled framer. All coral relocation/restoration areas will be mapped and all corals numbered to allow tracking of the coral head over time.
- B. **Ground-Truthing.** Each coral head will be measured (major and minor axis) at the time of photographing.
- C. **Comparison stations** adjacent to the relocation/restoration sites will be established to provide information as to the "natural" change in the hard coral cover. The documented changes in measurements of the coral heads (over time) will be compared to measurements made of the coral heads at the comparison stations.

**IV.4 MITIGATION FOR PIPELINE IMPACTS.** As the placement of the pipeline is anticipated to impact hardground reef, mitigation for the impacts will be conducted as approved by DEP. Prefabricated concrete and limestone modules will be placed with a corresponding artificial reef habitat creation-to-impact ratio of 1:1. The area of credit for the artificial reef modules will be the footprint of the module. Actual level of impact to be mitigated will be determined through the evaluation conducted during the post construction pipeline survey. These modules are to be constructed within 1 year of completion of the beach nourishment. Biological monitoring of the mitigation will be appropriate for the design and will be addressed in the Mitigation Proposal.

## **V. BEACH FILL COMPACTION AND SEDIMENT ANALYSIS.**

**V.1. COMPACTION MONITORING.** Compaction monitoring of the in-place beach fill will be conducted within one week of final grading of the beach fill, and quarterly thereafter for three years. A cone penetrometer, equivalent to that used by Nelson (1988) will be used for each assessment. Based on the results of the penetrometer analysis, the beach areas will be tilled to a depth of 36 inches prior to the start of the turtle nesting season and after consultation with the FDEP and the U.S. Fish and Wildlife Service, when the tilling criteria given in Section V.B. are present.

**A.** Penetrometer analysis of the beach fill areas will be conducted along lines perpendicular to the shoreline, at 500 foot intervals, throughout the length of the beach fill segments.

1. Two stations per line will be established with the first station one-third the distance between the dune (or seawall) and the mean high water line, and the second station two-thirds the distance between the dune (or seawall) and the mean high water line.

2. Triplicate readings will be made at three depths (6, 12 and 18 inches) at each station.

**B.** Tilling Criteria. Tilling of the beach fill will occur at the following times:

1. Along the entire length of filled beach within one week following completion of the placement and grading of fill material, and

2. Tilling will occur along those segments of the beach where adjacent sampling lines have cone penetrometer readings exceeding 500 "cone penetrometer units", at the same depth, only after consultation with the U.S. Fish and Wildlife Service's Office in Vero Beach, FL.

**V.2 WEEKLY GRAIN SIZE ANALYSIS OF BEACH FILL.** Grab samples of beach fill will be collected weekly for grain size analysis. Three samples will be collected along the length of beach on which fill was placed during the preceding week. All samples will be dry sifted with a minimum of six standard sized screens. All procedures will follow ASTM procedures for "dry" determination of grain size.

## **VI. SEA TURTLE MONITORING.**

The Sea Turtle monitoring may be subcontracted during construction by the selected contractor, however, Dade County D.E.R.M. will ensure that Sea Turtle Monitoring is conducted in a manner which meets the criteria and conditions established in the above referenced permits and existing FDEP Protected Species permit.

**VI.1 DAILY BEACH SURVEYS FOR NESTING ACTIVITIES.** If the beach nourishment project will be conducted during the marine turtle nesting season (May 1 through October 30), daily early morning surveys for sea turtle nests shall occur beginning May 1 or 65 days prior to project initiation (whichever is later), and continue through September 30. The project area will be surveyed each morning to check for sea turtle nesting activity. These activities will be conducted by an individual approved and permitted by the FDEP for such activities. As per special condition in the FDEP Protected Species Permit for Miami-Dade County beaches, all nests found on Miami-

Dade County beaches are relocated into a protective hatchery. Mr. Jim Hoover (Miami-Dade Parks and Recreation Dept.- Haulover Park) is the FDEP permitted sea turtle monitor for all of Dade County (excluding Golden Beach and Virginia Key) and manages the count's sea turtle hatchery and nest relocation program. The contractor will contact and coordinate all sea turtle monitoring needs and requirements with the permitted individual.

- A. All nest surveys and egg relocations shall only be conducted by personnel with prior experience and training in nest survey and egg relocation procedures and duly authorized to conduct such activities through a valid permit issued by the Department.
- B. Relocations will be conducted prior to 9 AM each day. Construction activity shall not occur in any location prior to the completion of necessary sea turtle protection measures.
- C. Report on all nesting activity and marine turtle protection measures taken during construction shall be provided for the initial nesting season following the completion of construction and for a minimum of three additional nesting seasons. Monitoring shall include daily surveys and additional measures for sea turtle protection authorized by the Department. Reports shall be submitted to the Department no later than 30 days after completion of all monitoring activities, and shall include daily report sheets showing all activity including nesting success rates, hatching success of all relocated nests, dates of construction, and names of all personnel involved in nest surveys and relocation. All such personnel shall be qualified as noted above.

**VI.3 ESCARPMENT LEVELING.** Visual surveys for escarpments along the project area will be made immediately after completion of the beach nourishment project, and prior to May 1 for three consecutive years. Results of the surveys shall be faxed to the Bureau of Protected Species Management (850)921-4369, prior to any action being taken. Escarpments that interfere with sea turtle nesting or measuring 18 inches high or higher and 100 feet long or longer will be leveled to the natural contour within 24 hours of their discovery. The Department shall be contacted immediately if subsequent reformation of the escarpments that can interfere with sea turtle nesting or that exceed 18" in height for greater than 100' occurs during the nesting and hatching season to determine the appropriate action to be taken. An annual report summarizing escarpment surveys and corrective action taken shall be submitted to the Department and the Service.

**VI.4 NOTIFICATION.** If an unmarked sea turtle nest or a dead, injured, or sick turtle is discovered during construction activities the sea turtle permit holder and the Bureau of Protected Species Management will be notified immediately such that appropriate conservation measures can be taken.

## **VII. HYDROGRAPHIC MONITORING PLAN.**

**VII.1. SCOPE OF THE PLAN:** This is presented to document Miami-Dade County's comprehensive, long-term monitoring plan for assessment of the performance of the Dade County Beach Erosion Control and Hurricane Surge Protection Project, inclusive of the 10.5 miles of Beach restored from 1975 to 1982, 2.5 miles of Sunny Isles Beach restored in 1988 and segments of Key Biscayne (approximately from reference monument DA-R7 through DA-R113).

Miami-Dade County has served as local sponsor for all the Dade County projects noted, which includes eight separate beach restoration and three beach renourishment contracts for the areas outlined above. Each of these contracts was permitted separately, with separate monitoring plans. This has resulted in a temporally and spatially fragmented data set for the project and effectively prevented comprehensive analysis of project performance. Further, the format of data collection has necessitated additional processing, and limited compatibility with other agencies.

The present plan, initiated in 1995, is submitted to address the past limitations and difficulty of assessing compliance with multiple permit conditions by development of an ongoing comprehensive monitoring program that will be used for the present and all future projects.

#### **VII.2. MONITORING PLAN OBJECTIVES:**

- A.** Insure a spatially and temporally consistent beach survey program on an annual basis over the full length of the Dade County Beach Erosion Control and Hurricane Surge Protection Project.
- B.** Establish a comprehensive beach profile database which will provide for easy data access and will be compatible with all existing State and federal agency database and GIS applications.
- C.** Provide greater flexibility than the current project-specific survey schedule to allow for the assessment of acute erosion events due to storms or other causes.

#### **VII.3. MONITORING PLAN COMPONENTS:**

- A.** Annual Project Surveys and Aerial Photo Documentation. This component will consist of project-wide profile surveys at approximately 1000 ft intervals extending from the north Dade County line to the southern tip of Key Biscayne, inclusive of Golden Beach, Fisher Island and Virginia Key (Reference monuments R1 - R113). Survey profiles will be referenced to specific monuments (i.e., Range 0+00 = monument location). The profiles will extend from a position landward of the monument sufficient to include existing dune features or other topographic features located on the beach proper out to a distance of 2,500 feet seaward, or closure, whichever is greater. Elevations will be determined minimally at 25 ft intervals along the full length of the profile. In addition, 1":300' controlled aerial photographs will be provided of the coast over the entire project length and provided to the FDEP in a reproducible format.
- B.** Project Specific Monitoring of Sunny Isles Renourishment Sites. New renourishment sites along the project length will have additional interim surveys, which will be conducted midway between the annual surveys for a period of 2 years, to better assess fill adjustment and project performance. To allow better assessment of the performance of the breakwater structures, profile lines shall be spaced at 250' intervals directly adjacent to the structures (between R7 and R8) and for a distance of 1000' north (to R6) and south (to R9).